DOCUMENT RESUME

ED 246 385 CS 007 603

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TITLE Reciprocal Teaching: Working within the Zone of Proximal Development.
PUB DATE Apr 84
NOTE 22p.; Paper presented at the Annual Meeting of the American Educational Research Association (68th, New Orleans, LA, April 23-27, 1984).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; *Educational Theories; Elementary Secondary Education; Feedback; Grade 7; *Reading Instruction; *Reading Research; Remedial Instruction; *Student Teacher Relationship; Teacher Effectiveness; Teacher Response; *Teaching Methods
IDENTIFIERS *Reciprocal Teaching

ABSTRACT

A study compared the effectiveness of four instructional procedures designed to teach four strategies: summarizing, question generating, clarifying, and predicting. The four procedures were (1) reciprocal teaching/corrective feedback, which requires that initially the teacher do a considerable amount of instruction about and modeling of the four strategies using dialogue with the students; as the days of instruction proceed, the students are given more responsibility for initiating and sustaining the dialogue while the teacher guides this practice, using modeling and corrective feedback specific to each student; (2) reciprocal teaching/practice, identical to the procedure just described, with the exception that after the first four days, students continue to practice the strategies by writing summaries, questions, points to be clarified, and predictions on assigned segments of text, while teacher feedback is minimal; (3) demonstration, which requires the teacher to demonstrate each strategy; and (4) treated control, in which the students are given worksheet activities regarding the four strategies. Subjects were seventh grade students in developmental reading classes. All groups used the same materials. Results indicated that the most effective of the four instructional procedures was reciprocal teaching with corrective feedback, followed by reciprocal teaching with practice, and the control treatment. The findings suggest the importance of such instructional components as the need to work within the zone of proximal development (the "region of sensitivity to instruction") and to use a scaffolded and proleptic approach (transfer of responsibility for learning from teacher to student). (Examples of reciprocal teaching dialogue are appended.) (FL)

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Reciprocal Teaching: Working Within the Zone of Proximal Development

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Paper presented at the annual meeting of the American Educational Research Association, New Orleans, April, 1984.

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The author wishes to acknowledge Ms. Melinda Samsel for her invaluable assistance with data collection and preparation of this paper. She also wishes to thank Ms. Debbie Dunn for her skillful participation in data collection. Finally, appreciation is extended to Dr. Ann Brown for her continued support and guidance.

CS207603

For the past four years we have investigated the effectiveness of teaching middle school students who are poor comprehenders four reading strategies designed to foster comprehension and comprehension monitoring. The strategies include self-directed summarizing, question generating, demanding clarity, and predicting. We started off small with the investigator working with students individually and then later in pairs (Brown & Palincsar, 1982). We measured a number of dimensions regarding our intervention including acquisition and refinement of the four strategies, change in comprehension on both formal and informal instruments, maintenance of improvement, and transfer to tasks that were similar but distinct from the training task. Our confidence buoyed by the improvements students demonstrated in each of these areas we recruited volunteer teachers to implement the instructional procedure with their small reading groups (Palincsar & Brown, in press). This series of training studies culminated last year in the adoption of the procedure by six reading teachers of a middle sized city (Palincsar & Brown, in preparation). Subjected to the impetuousity of our junior high students, the vagaries of our school days, and the unique styles of our teachers, the intervention emerged--weathered--but still effective.

Having satisfied ourselves that teachers with modest preparation can successfully teach their students to learn and employ these strategies for the purpose of enhancing reading comprehension, we are now asking ourselves why it works. There are, of course, a number of ways in which one might unpack such an intervention program. Two obvious facets to evaluate are 1.) what is being taught (i.e., the four strategies); and 2.) the instructional procedure (how the four strategies are taught).

This paper will focus on the second of these facets: the instructional procedure. We have called the instructional procedure "reciprocal teaching" drawing upon the notion that in a reciprocal exchange one party acts by way of return or response to something previously done by the other party. I will first describe what this procedure "looks like" and then proceed to describe its theoretical ancestry. The instruction occurs in the form of a dialogue between the teacher and students focused on a segment of text and structured by the four strategies. When the procedure is first implemented, the teacher models how she uses the four strategies in the process of reading. For the initial days of training the majority of the students are merely respondents in this exchange -- they answer the questions generated by the teacher, elaborate upon her summaries, clarifications, and predictions (if they are able). As the days of instruction proceed, the students are given the opportunity to assume the role of teacher -- initiating and leading the discussion of the text segment. The teacher's role now becomes defined by the need to provide the student guided practice. The amount and kind is dependent upon the nature of the text and the individual needs of the student. Some students will require little more than an occasional prompt -- others will require further instruction -- for example -- on the qualities of a good summary -- or further modeling.

For illustrative purposes a few examples of reciprocal teaching dialogue will be shared at this point.

Insert Table 1

Discussion of the reciprocal teaching procedure is facilitated by reference to Vygotsky's concept of the "zone of proximal development" and the extrapolations of this concept by a number of developmentalists. (Brown, 1979; Bruner, 1966; Cole, 1978; Rogoff, 1984; Wertsch, 1979).

Vygotsky defined the zone of proximal development as the "distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1979, p. 86). Wood, Bruner, and Ross, (1976) refer to the zone as a "region of sensitivity to instruction."

The first order of business becomes, then, identifying the zone for each student. As Peter Johnston argues in this symposium, successful identification suggests the need for dynamic assessment which focuses on process rather than product. While our pretesting includes measures of comprehension as assessed by answers to comprehension questions, we also assess the students' entering skills with each of the four strategies. However, assessment doesn't end with the completion of this pretest; indeed, it is only the beginning. The teachers are encouraged to use the interaction with their students as an opportunity for continuous assessment. As the students engage in the four strategies there are numerous opportunities for the teacher and, in fact, the students themselves to note that there has been a break-down in comprehension and to identify the source of the break-down. Transcripts of reciprocal teaching dialogue reveal the impediments one might anticipate such as difficult vocabulary and unclear referents but also more subtle impediments such as unwieldy text construction or figurative language that apparently escapes the students.

The instructional objective is, of course, to help the students incorporate new skills and move closer to competency with and independent application of these new skills. Rogoff and Gardner (1984) speak of the need to identify a scaffolded situation from which the expert -- in this case the teacher -- provides the opportunity for the novice to extend current skills to a higher level. Wertsch and Stone (1979) refer to proleptic teaching as

a means of facilitating this extension. Proleptic teaching focuses on the learner as participant in the instructional activity. The teacher provides explanation and modeling. The reciprocal teaching procedure is intended to provide opportunities for both scaffolding and proleptic teaching.

Scaffolding occurs by virtue of the fact that the desired level of performance with the strategies is determined on an individual basis at any time in instruction. This process can be illustrated by including bits of dialogue involving two students at various stages in the acquisition of question generating.

Insert Table 2

The reciprocal teaching procedure exemplifies proleptic teaching in that there is a gradual transfer of responsibility for the learning activity -- in this case the dialogue-from teacher to student. When the verbalizations of five teachers were categorized for the purposes of comparing instructional and modeling statements with corrective feedback statements, the mean proportion of corrective feedback statements for the entire period of intervention was 48% compared to 44% for modeling statements and a meager 8% for instructional statements. Furthermore, there was a steady increase in the corrective feedback statements accompanied by a corresponding decrease in the instructional and modeling statements over time.

We have found ourselves attributing the success of the students' experience acquiring and applying the four strategies to the attributes of the instructional techniques just described: we attempt to work within the zone of proximal development, the teacher creates a scaffold to support the new learning, and instruction is proleptic, emphasizing learner participation in the activity. During the past academic year we have begun a new study to determine the relative merits of the various components of the instructional procedure. I would like to share the data gathered, to date, at this time.

The purpose of the study has been to compare the effectiveness of four instructional procedures to teach summarizing, question generating, clarifying, and predicting. The instructional procedures have been designed to vary the opportunity for teacher-student interaction and guided practice in the context of reading. A description of the four instructional conditions of the study follows.

1.) The reciprocal teaching/corrective feedback procedure. This procedure is being implemented in a manner identical to previous studies. During the initial days of intervention the teacher does a considerable amount of instruction regarding and modeling of the four strategies using dialogue with the students. As the days of instruction proceed, the students are given more responsibility for initiating and sustaining the dialogue while the teacher guides this practice using modeling and corrective feedback specific to each student.

2.) The second procedure we call reciprocal teaching/practice. For the first four days of instruction the intervention is identical to the reciprocal teaching procedure just described. However, beginning the fifth day, practice continues by having the students write summaries, questions, points to be clarified, and predictions on assigned segments of text. Feedback is fairly minimal in that the teacher only indicates to the students which of their responses were good by starring those items.

3.) The third condition is called demonstration and, as such, is fairly self-explanatory. The teacher demonstrates the four strategies on each day of intervention. Interaction and practice are fairly minimal as the only participation by the students is when they answer the questions generated by the teacher.

4.) The fourth condition we call treated control -- the students are given worksheet activities regarding the four strategies. They are introduced to one strategy at a time. These worksheets are constructed so that the students experience a shaping procedure. To illustrate, using the task of questioning, the students are first asked to read a sentence and ask a question about the information contained in that sentence. An appropriate question word with which to begin the question is provided. This question word is then faded out. The students are then presented short paragraphs and are asked to choose the best of three questions about that paragraph. The questions are constructed in such a manner that one cannot be answered by the information in the text, one asks about a point of minutia in the paragraph, and one addresses the main idea of the paragraph. Finally, the students are asked to read a paragraph, underline the important information and write a question about that information. These worksheets are done with the teacher -- hence there is a considerable amount of interaction. It is more difficult to characterize the amount of practice; each student completes his or her own worksheets -- hence, time on task is quite good, however, there are no opportunities to integrate and practice these strategies in the context of reading. These strategies are exercised in isolation from one another and from the overall task of reading to learn.

There is a fifth group which constitutes an untreated control. These students experience only the assessment associated with the study, which will be described shortly.

Method

Students

The selection criteria we have used are identical to those used in earlier studies. The students are seventh graders attending developmental reading classes in three middle schools. They are decoding seventh grade

reading material with at least eighty words per minute accuracy and with an error rate of two or fewer error words per minute. In addition, the students are eligible only if they fail to score above fifty percent on a criterion referenced measure of comprehension. Once the pool of eligible students is determined the groups are formed by class period -- matching across class periods by decoding rates and comprehension scores. There are typically four students chosen from each class period. The groups are then randomly assigned to one of the five conditions. Each condition has been run three times.

Materials

The training materials are the same for each instructional condition including the treated control group which receives the material in the worksheet format described earlier. The training materials are also the ones used in the earlier studies of the reciprocal teaching procedure. They are expository passages, written at the seventh grade level according to the Fry Readability Formula and have been taken from a variety of basal readers.

The assessment materials are also identical to those used in earlier studies. The assessment passages are 475-500 words in length, are expository, and are written at the seventh grade level. The ten questions which accompany each passage are constructed so that four are text explicit, four are text implicit, and two are script implicit (Pearson and Johnson, 1978). The assessment passages have been randomized across all students participating in the study.

The students are also completing two transfer measures on a pre- and post-test basis. These are the summarizing and question predicting tasks used in earlier work. These data are still being collected, scored, and

analyzed; therefore there will be no further discussion of them.

Procedures

Baseline. Following the assignment of students to groups, there is a baseline period during which the students complete the pretests and also complete one assessment passage daily for five days. The students are asked to read the assessment passage silently and carefully so that they will be able to answer comprehension questions when they are finished. The students' scores on these assessment passages are graphed and shared with the students on a daily basis. Upon the completion of baseline, the students are ready to begin instruction with the exception of the untreated control group which continues to complete one assessment passage daily.

Instruction. There are a number of similarities among the instructional groups. These similarities will be described first. All students, prior to instruction, receive the same introduction to the instructional activity. There is a discussion of what they will be learning (the four strategies), why they will be learning these strategies, and in what situations these strategies will be helpful. These remarks are repeated every other day during instruction. The instructional activity, as described earlier for each group, occurs for 20-25 minutes a day followed by an assessment period of 10-15 minutes. As occurred during baseline, the students are shown the result of their performance on the previous day's assessment daily. There are a total of twelve days of instruction for each group. We selected twelve days because it was by day twelve that students began to achieve stable performance in our earlier work.

Results

The results are depicted in Figure 1 which represent the means of each group on the daily comprehension assessments collapsed over the students

involved in the three replications. The means are presented for baseline, first half of training (six days), and second half of training (six days). The baseline means for the five groups are quite comparable and range from 38.5 to 41.3. After the first half of training, the four instructional groups look remarkably alike, the mean scores hovering around 50 to 52. The untreated control indicate some response to practice with the assessment procedure, in hand with knowledge of results, as they also have demonstrated some increase to a mean of 46. By the second half of the intervention phase this acceleration on the part of the untreated control group is no longer detected. This is also true of the demonstration condition. In fact, performance has begun to decline by this point. The reciprocal teaching/practice group and treated control continue to show some -- although slight -- improvement for the second half of training. The mean gain score for the reciprocal teaching-practice group is 14.4 points and for the treated control is 12.1 points. In contrast, the reciprocal teaching/corrective feedback group achieves a mean for the second half of training that exceeds their mean for baseline by 22.7 points.

Insert Figure 1

In summary, the most effective of the investigated instructional procedures appears to be the reciprocal teaching with corrective feedback, followed by the reciprocal teaching with practice and the treatment control condition in which the students received the worksheet activities regarding the four strategies. Demonstration appears to be the least effective of the instructional conditions. We are encouraged that these results testify to the importance of the instructional components addressed earlier in this paper -- the need to work within the zone of proximal development, using a scaffolded and proleptic approach. To conclude, one of the students in the demonstration condition informed our teacher with a certain air of disgust --

"You know, a better way to do this would be for all of us to stand up and do it." What an astute observation!

Table 1

Sample Reciprocal Teaching Dialogue

Teacher: The title of this story is Genius with Feathers. Let's have some predictions. I will begin by guessing that this story will be about birds that are very smart. Why do I say that?

S1: Because a genius is someone really smart.

Teacher: But why would I say "birds that are very smart?"

S2: Because they have feathers.

Teacher: That's right. Birds are the only animals that have feathers. Let's predict now the kind of information you might read about very smart birds.

S3: What kinds of birds?

Teacher: Good one. What kinds would you guess are very smart?

S3: Parrots or blue jays.

S1: A cockatoo like on Baretta.

Teacher: What other information would you want to know?

No response.

Teacher: I would like to know what these birds do that is so smart. Any ideas?

S2: Some birds talk.

S4: They can fly.

Teacher: That's an interesting one. As smart as people are, they can't fly. Well, let's read this first section now and see how many of our predictions were right on. I will be the teacher for this one.

(All read silently)

Teacher: My question is, "Who is the genius with feathers"?

S1: Crows.

Teacher: That's right. So we were correct in our prediction that this would be about birds but we didn't correctly guess which bird, did we?

My summary would be that these paragraphs describe the clever things that crows do which make them seem quite intelligent. Is there anything else I should add to my summary?

S1: How they steal corn?

Teacher: Well now, that's a detail which described one of the ways in which they are clever. For our summary we will not include these details.

I believe I found a word that needs clarification. What does "resourceful" mean?

S: No response.

Teacher: If I say that you are a resourceful person, I mean that you are able to deal with problems and difficulties easily. Being resourceful is another way in which crows are intelligent. I would like to make a prediction now. The last sentence says, "One major reason they have mastered survival against heavy odds is their amazing communication system". My prediction is that they will now describe this communication system. How do you think crows communicate with one another?

S: Caw-caw.

S: With a special song.

Teacher: Alright. Let's read on. Who will be the teacher for this section?

(Dialogue which illustrates the student, Jim, leading the discussion and the teacher providing corrective feedback).

S1: How do crows communicate with one another?

Teacher: Good question! You picked right up on our prediction that this is about the way crows communicate. Whom do you choose to answer your question?

S1: Barb.

S2: Crows have built-in radar and a relay system.

S2: That's a good part of it. The answer I wanted was how they relay the messages from one crow to the other crow.

Teacher: Summarize now.

S1: This is about how crows have developed a system.

Teacher: Of what? You must include the whole main idea.

S1: Of communication.

Teacher: That's right. The paragraph goes on to give examples of how they use pitch and changes in interval but these are supporting details. The main idea is that crows communicate through a relay system. Jim?

S1: Any clarifications?

S2: Does relay mean to transpose?

S1: (looks to teacher)

Teacher: Well, to transpose means to change - like in music - I would transpose a song by playing it higher or lower. To relay just means to pass on. Like in a relay race the runners pass on a baton from one person to another until the race is over. Ok? Any more clarifications?

S1: I'm a little unclear about something in this paragraph.

Teacher: Ok. What would that be?

S1: I just want to make sure about being great mimics. Does that mean that they're smart and they pick up things very quickly?

Teacher: That's part of it. Dave, what do you think a mimic is?

S2: Like imitate somebody else's voice, can imitate something.

S3: Like that one guy, what's his name on HBO, Rich Little.

Teacher: Rich Little does impersonations. He mimics or imitates not just the person's voice but also the way they walk and what they say. To mimic is to imitate or copy. That was a good point to clarify. Jim?

S1: My prediction is -
It says here that the crows can use their communication system to play tricks, so maybe something about the tricks they play? I would like Sue to be the next teacher.

Teacher: Excellent prediction. The last sentence of a paragraph often can suggest what the next paragraph will be about. Good for you.

Table 2

The Acquisition of Question-Asking by a Weak Seventh Grade Student (Charles)

Day 1:

TEXT:

> The water moccasin, somewhat longer than the copperhead, is found in the southeastern states. It lives in swampy regions. It belongs, as do also the copperhead and the rattlesnakes, to a group of poisonous snakes called pit vipers. They have pits between their eyes and their nostrils which, because they are sensitive to heat, help the snakes tell when they are near a warm-blooded animal. Another name for the water moccasin is "cottonmouth." This name comes from the white lining of the snake's mouth.

1) S: What is found in the southeastern snakes, also the copperhead, rattlesnakes, vipers - they have. I'm not doing this right.
2) T: All right. Do you want to know about the pit vipers?
3) S: Yeah.
4) T: What would be a good question about the pit vipers that starts with the word "why?"
5) S: (No response)
6) T: How about, "Why are the snakes called pit vipers?"
7) S: Why do they want to know that they are called pit vipers?
8) T: Try it again.
9) S: Why do they, pit vipers in a pit?
10) T: How about, "Why do they call the snakes pit vipers?"
11) S: Why do they call the snakes pit vipers?
12) T: There you go! Good for you.

Day 4:

TEXT:

> Spinner's mate is much smaller than she, and his body is dull brown. He spends most of his time setting at one side of her web.

13) S: (No question)
14) T: What's this paragraph about?
15) S: Spinner's mate. How do spinner's mate...
16) T: That's good. Keep going.
17) S: How do spinner's mate is smaller than...How am I going to say that?
18) T: Take your time with it. You want to ask a question about spinner's mate and what he does, beginning with the word "how."
19) S: How do they spend most of his time sitting?
20) T: You're very close. The question would be, "How does spinner's mate spend most of his time?" Now, you ask it.
21) S: How does spinner's mate spend most of his time?

Day 7:

TEXT: Perhaps you are wondering where the lava and other volcanic products come from. Deep within our earth there are pockets of molten rock called magma. Forced upward in part by gas pressure, this molten rock continually tries to reach the surface. Eventually--by means of cracks in the crustal rocks or some similar zone of weakness--the magma may break out of the ground. It then flows from the vent as lava, or spews skyward as dense clouds of lava particles.

22) S: How does the pressure from below push the mass of hot rock against the opening? Is that it?
23) T: Not quite. Start your question with, "What happens when?"
24) S: What happens when the pressure from below pushes the mass of hot rock against the opening?
25) T: Good for you! Good job.

Day 11:

TEXT: One of the most interesting of the insect-eating plants is the Venus's flytrap. This plant lives in only one small area of the world -- the coastal marshes of North and South Carolina. The Venus's flytrap doesn't look unusual. Its habits, however, make it truly a plant wonder.

26) S: What is the most interesting of the insect eating plants, and where do the plants live at?
27) T: Two excellent questions! They are both clear and important questions. Ask us one at a time now.

Day 15:

TEXT: Scientists also come to the South Pole to study the strange lights that glow overhead during the Antarctic night. (It's a cold and lonely world for the few hardy people who "winter over" the polar night.) These "southern lights" are caused by the Earth acting like a magnet on electrical particles in the air. They are clues that may help us understand the Earth's core and the upper edges of its blanket of air.

28) S: Why do scientists come to the south pole to study?
29) T: Excellent question! That is what this paragraph is all about.

Improvement in Question-Asking by a More Competent Seventh Grade Student (Sara)

Day 2:

TEXT:

> HOW CAN SNAKES BE SO FLEXIBLE?
>
> The snake's skeleton and parts of its body are very flexible--something like a rubber hose with bones. A snake's backbone can have as many as 300 vertebrae, almost ten times as many as a human's. These vertebrae are connected by loose and rubbery tissues that allow easy movement. Because of this bendable, twistable spinal construction, a snake can turn its body in almost any direction at almost any point.

1) S: Snake's backbones can have as many as 300 vertebrates - almost ___ times as many as humans.
2) T: Not a bad beginning, but I would consider that a question about a detail. Try to avoid "fill in the blank" questions. See if next time you can fine a main idea question and begin your question with a question word - how, why, when....

Day 3:

TEXT:

> There are snakes in nearly all parts of the world. Some snakes prefer warm, arid desert areas. Others prefer leafy forests, fields, and woodlands. Some stay in areas near water and are fine swimmers. Then there are several varieties that live all their lives in the sea.

3) S: Can snakes live their whole lives in seas? (Note: lifted directly from the text segment, "some snakes live their whole lives under the sea")
4) T: See if you can ask a question using your own words.

Day 4:

TEXT:

> The other kind of camel--the one with two humps--is the Bactrian. Its home country is the Gobi Desert of northeastern Asia. The Bactrial has shorter legs and longer wool than the one-humped camel. It also has stronger, more rugged feet. This is important because instead of having sand to walk on, the Bactrian camels live in rough and rocky parts of the world.

5) S: Where is the Bactrian found?
6) T: Good for you.

Day 6:

TEXT: When most full-grown spiders want to travel, they have to walk on their eight legs. But some small kinds of spiders, and many young ones, use an easier way. They climb up on bushes, fence posts, or weed stems and spin streamers of silk. When the wind catches the silk and blows it away, each spider tightly holds onto his own streamer. The silk streamer carries him through the air as if it were a parachute or a balloon.

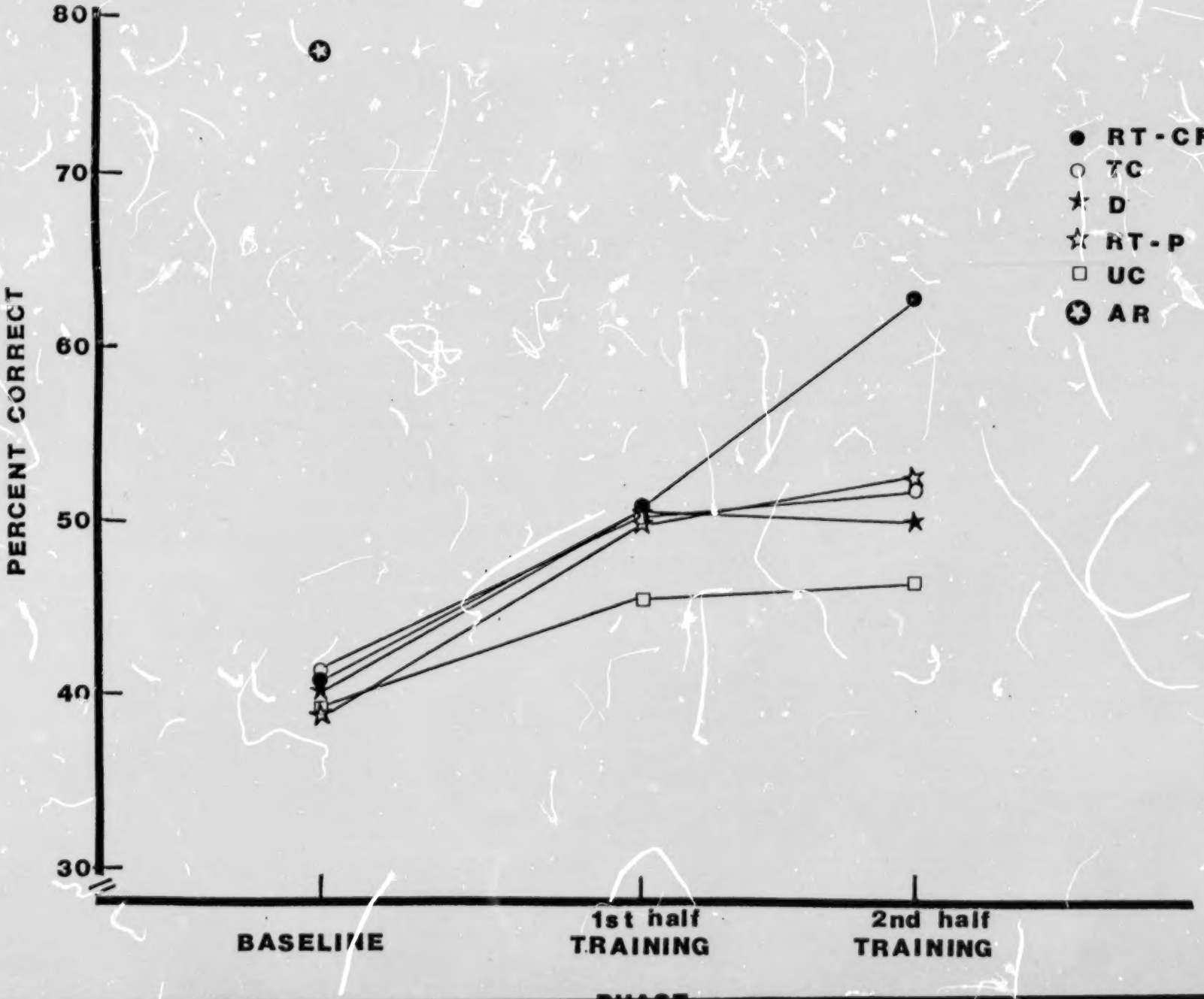
7) S: I think I have another. When it's traveling, what do they compare the spider to?
8) T: An interesting question.

Day 11:

TEXT: The young caterpillar's first meal is its own eggshell. Then it eats a leaf and each day eats more and more food. After a few days, the caterpillar becomes too large for its skin. A new skin forms beneath the first one, the old skin comes open and, like a snake, the caterpillar wriggles its way out of the split skin. Then the caterpillar goes on eating leaves or other kinds of food. When the new skin becomes too tight for the growing body, it again splits and comes off. By then the caterpillar is covered by another skin. This eating and shedding goes on for several weeks. The old skin may be replaced by a new one four or five times. Each time the skin is shed, the size and color of the caterpillar change.

9) S: Why does the caterpillar's skin split?
10) T: Excellent question. That was the point of the entire paragraph.

Figure 1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PERCENT CORRECT
RT-CF
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BASELINE
1st half TRAINING
2nd half TRAINING
PHASE

21

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